

TITLE

## BUILDING COMPONENTS AND METHOD OF MAKING SAME

BACKGROUND OF THE INVENTIONField of the Invention

The present invention relates to building components, for incorporation into building structures, and to methods of making building components.

Description of the Related Art

In the construction of timber frame buildings, it has previously been proposed to prefabricate a rectangular frame, formed of lengths of lumber connected together to form the frame, and to subsequently incorporate this prefabricated frame in the wall of a timber frame building structure so as to reinforce the wall against racking forces produced, for example, by hurricanes or earthquakes.

Such prefabricated rectangular frames can be reinforced against racking forces by lengths of lumber suitably arranged within the frame and interconnecting the sides, top and bottom of the frame, by suitable sheathing and/or by metal corner reinforcements provided at the corners of the frame.

BRIEF SUMMARY OF THE INVENTION

The present invention is based on the concept that a prefabricated building component in the form of a frame can advantageously be reinforced by applying a reinforcement sheet to a part or to the entirety of at least one side of the frame so as to form a hardened reinforcement layer or "skin" on the frame, this layer or "skin" being resistant to outside forces and, thus, to deformation of the frame by racking forces.

The reinforcement sheet may be a coating material applied in a flowable condition to the frame and may be reinforced by fibers to form a fiber reinforced composite. For example, a mesh of reinforcement fibres can be applied to one or both sides of the frame and the layer of the coating material can then be applied, in a flowable condition, onto the mesh so as to penetrate the mesh and to adhere to the lumber of the frame.

Alternatively, the reinforcement sheet may be made separately from the frame and subsequently applied as a prefabricated reinforcement sub-component to the frame.

Preferably, heat insulating foam material is provided in the frame between the lengths of lumber so as to form a heat barrier, and the coating material is applied so as to coat and adhere to one side of this heat insulating barrier.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more readily understood from the following description of a preferred embodiment thereof given, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 shows a view in front elevation of a building component according to one embodiment of the present invention;

Fig. 1A shows a broken-away view of an adjacent pair of building components such as that of Fig. 1;

Figure 1B shows a view in perspective of a corner connector employed in the building components of Figures 1 and 1A;

Figure 1C shows a view in perspective of a modification of the corner connector of

Figure 1B;

Figure 2 shows a broken-away view taken in section along the line 2 - 2 of Figure 1;

Figure 3 shows a broken-away view in front elevation of a corner portion of the building component of Figures 1 and 2; and

Figure 4 shows a view in side elevation of a further corner connector.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in Figure 1 of the drawings, a building component, which is indicated generally by reference numeral 10, comprises a rectangular frame assembled from lengths of lumber and, more particularly, the frame is formed by top and bottom rails 12 and 14, by opposite side members 16 and by vertical studs 18 spaced apart from one another, in a conventional manner, between the side members 16 and extending between the top and bottom rails 12 and 14. These lengths of lumber are connected to one another, in a conventional manner, by nails (not shown), and in addition metal corner reinforcements 20 are provided at the four corners of the frame, between the top and bottom rails 12 and 14 and the side members 16.

In the spaces between the top and bottom rails 12 and 14, the side members 16 and the studs 18, a heat insulating foam material 22 is provided so as to form a heat insulating barrier 24. As can be seen in the cross-section of view of Figure 2, this heat insulating barrier 24 occupies only approximately one half of the spaces between the studs 18 and the side members 16, so as to leave the remainders of these spaces free for accommodating plumbing, electrical conduits, etc.

Over one entire side of the frame, there is provided a reinforcement sheet in the form of a coating layer indicated generally by reference numeral 26. This reinforcement coating layer 26 adheres to the lengths of lumber and to the heat insulating barrier 24 at this one side of the

building component 10 and, in addition, overlaps and adheres to a portion of the periphery of the frame.

Within the reinforcement layer 26 there is provided a reinforcement of fibre material and, more particularly, a mesh 28 of fibre material, which likewise extends over the entire area of one side of the frame and, also, overlaps the peripheral of the frame.

One material which has been found to be suitable as the material of the reinforcement coating layer is sold under the trade mark GINSITE by Ginsite Materials, Inc., of Plantation, Florida, U.S.A. , but other suitable coating materials may be substituted. It is, however, a requirement of the coating material that it can be applied and adhered to the frame and that it subsequently resists forces exerted on the coating material and, thus, will resist distortion of the frame by racking forces applied to the frame.

In the present embodiment of the invention, the fiber material of the mesh 28 is glass fiber. However, other suitable fiber materials may be alternatively employed. For example, carbon fiber, aramid fiber, organic fiber material such as sisal, bamboo, wood or straw, or metal fibers, such as steel, aluminum, etc., may be utilized.

For further information as to suitable fiber reinforced composite materials, reference is made to "THE SCIENCE AND TECHNOLOGY OF ENGINEERING MATERIALS", pp. 359 - 363, by J. Francis Young, published by Prentice-Hall, Inc.

It may be possible, in some cases, to omit the reinforcement fibres, provided that the coating material itself provides sufficient resistance to racking forces.

One of the corner reinforcements 20 is shown in greater detail in Figure 1B and comprises a box-shaped section 30 having four sides 32, 33, 34 and 35; laterally extending flange 36 and 37 projecting horizontally from the sides 33 and 35 and a vertically extending flange 38 projecting

from the side 32, i.e. the top, of the box-shaped section 30. More particularly, the flanges 36 and 38 extend from the mid-sections of the sides 33 and 32, which as can be seen from Figure 1A are dimensioned so that the flanges 36 and 37 fit snugly on top of the rails 14 of an adjacent pair of the frames of Figure 1, while the vertical flange 38 fits between the vertical sides of these two frames. The flanges 36, 37 and 38 are secured to the frames by nails or staples (not shown), with the ends of the lumber in abutment with the box-shaped section 30.

The modified corner connector shown in Figure 1C and indicated generally by reference numeral 20a has a box-shaped section 30a with lateral and vertical flanges 37a and 38a, but in this case the flanges 37a and 38a are located in alignment with sides 34a and 35a at the bottom and one side of the box-shaped section 30a. This corner connector 20a is intended for connection to the lumber of only one of the frames, so as to not project from the frame. If required, the corner connector 20a of Figure 1C can be further modified by the addition of a vertical flange 40 extending along one or both longitudinal sides of the lateral flange 36a and secured to the rail 14 by nails or staples (not shown).

In the making of the building component 10, the lengths of lumber are firstly connected to one another by nailing and by the corner reinforcements in order to form the frame, and the heat insulating foam material 22 is then injected into the frame so as to form the heat insulating barrier 24.

The reinforcement fibre material mesh is then spread over one side of the frame, on the lumber and the heat insulating barrier 24, and the coating material is subsequently applied onto the reinforcement fibre material mesh so that it impregnates the mesh and adheres to the lumber and to the heat insulating barrier 24. The material may be thus applied manually by e.g. a trowelling or scraping action, or by spraying, e.g. by relative movement between the frame and one or more spray nozzles. The coating material is then left to harden so as to form the reinforcement "skin" or sheet on the frame

Alternatively, the barrier 24 may be formed between the lengths of lumber after the reinforcement layer 26 has been formed., the fiber material mesh being applied to the frame prior to the application of the heat insulating foam material.

As shown in Figure 2, the reinforcement layer 26 is applied on both sides, on the peripheral edge and on a portion of the rear side of the G1 frame, although it may be applied so as to cover only a portion of one or both sides of the frame..

Thus, it is to be understood that Figures 1 to 3 illustrate only one embodiment of the invention, and that various modifications may be made within the scope of the present invention.

For example, it may not always be essential for the reinforcement sheet or "skin" to be co-extensive with one side of the frame but, rather, this sheet may be provided in the form of a diagonal strip or diagonal X-shape to the frame. It is not essential for the frame to be rectangular.

Also, while the building component 10 is intended for subsequent incorporation into the wall of a timber frame building, it is to be understood that the present invention is not restricted to wall components but may, for example, be employed for panels for roofs, floors or other structural components.